

WASTE TRANSFER SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the benefit of U.S. Provisional Application No. 60/390,588, filed on June 21, 2002, and U.S. Provisional Application No. 60/391,799, filed on June 27, 2002, the disclosures of which are incorporated by reference herein.

FIELD OF THE INVENTION

[0002] The present invention relates to apparatus for transferring waste material. More particularly, the present invention relates to containers for use in the transfer of waste material.

BACKGROUND OF THE INVENTION

[0003] The predominant method for long distance transport of municipal solid waste, as well as construction and demolition debris (all of which is referred to herein as "waste") is to deliver the waste from local garbage, dump or roll-off trucks to a transfer station. At a transfer station, the waste is either dumped onto a tipping floor, where it is compacted using large cleated machines which roll over the waste and crush the waste so as to increase its density, or it is placed into a mechanical compacting machine, which also compacts the waste to increase its density. The purpose of increasing the density of the waste is to maximize the weight of the waste loaded into each container in order to achieve an economically efficient method of transportation, whether by rail or by road.

[0004] The waste is then placed into containers, walking floors, truck trailers or dump truck trailers, which can travel over-the-road. Consequently, the containers cannot measure more than about 8 1/2' wide, and are no more than about 12' high in order to meet standard road clearances. Furthermore, compacting equipment is not effective for containers which are more than 9' high. When the containers

are transported by rail, they are placed on flat-bed rail cars for rail transportation to distant disposal sites. It should be noted that rail cars traveling on tracks, with what is known in the rail industry as Plate "F" clearance (referred to herein as a "standard railroad clearance") which is standard along most rail lines in the eastern portion of the United States, can handle containers up to about 10 1/2' wide and 13' high.

[0005] When taking into account the weight of rail cars and containers, the maximum amount of waste which can be loaded onto a standard flat car is approximately 94 tons (net of the weight of the container). Thus, 4 containers with 23 1/2 tons each would achieve this goal, or 28 tons each on an articulated rail car. However, even with compaction, it is difficult to regularly achieve a weight of 23 1/2 tons per 8 1/2 foot wide container.

[0006] The transport of waste by rail is more economical, less congesting and has lower environmental impact than is the case with the use of trucks on public roads and highways. However, rail heads, particularly those in urban areas, generally lack the space to locate a transfer station with a tipping floor at or adjacent to the rail head. Consequently, in order to utilize rail transport, the waste must be dumped at a distant transfer station, compacted, loaded into a container, the container must then be loaded onto a truck, driven to a rail head, and then reloaded onto a rail car. Not only does the multiple handling and driving add to the overall cost of waste transport by rail, but the fact that the container must travel over the road means that it must also still fit within road clearances, which limits the amount of waste that can be transported in each container and rail car, adding further to the cost of waste transport by rail.

[0007] The New York City Department of Sanitation ("NYCDOS") has a unique system for the transloading of

municipal solid waste. NYCDOS owns and has operated eight marine transfer stations strategically located around the New York City waterfront. Roll-off and packer garbage trucks would pick up the waste from curbside locations and bring it to one of these marine transfer stations. Each such station was designed so that a hopper barge could fit under the lip of a transfer floor. A truck would thus drive onto the floor of the station and back up so that it could discharge directly into a barge situated under the overhanging lip of the transfer floor. Each barge could hold up to about 700 tons of the waste material, with the average being around 630 tons. When the barge was filled, it would be pulled out of the marine transfer station and an empty barge towed back into its place.

[0008] Several of the filled barges would then be towed to a landfill location, where material handlers would dig out the waste from the barge for disposal at the landfill. With the closing of these landfills, NYCDOS has been unable to find a suitable location to which to bring the barges for offloading onto trucks or rail cars.

[0009] NYCDOS has desired to continue utilizing this marine transfer station system, and has thus sought a way to place the waste directly into containers within the marine transfer station itself so that the containers, in turn, could be placed onto rail cars, deep water vessels or trucks, either at the station or at a central intermodal transloading location. However, because of space and logistical constraints, to date, NYCDOS has been unable to find a process or mechanism to enable it to place this waste into containers directly at the station which meets its logistical and space constraints and requirements.

[0010] Current proposed systems for containerized waste at such marine transfer stations include: trucks dumping directly into containers located on barges; trucks dumping onto a tipping floor at the station and then loading the waste

directly into containers or into a compactor on the tipping floor; and trucks dumping into a hopper on a barge next to the tipping floor, and using compaction equipment located on the barge to compact the waste into containers on the same or an adjacent barge. Each of these systems requires considerable space, limits unloading positions at the station, requires considerable cycle time to complete the unloading and compaction into containers, results in smaller amounts of waste which can be compacted into a container, results in smaller amounts of waste which can be loaded onto each barge and/or requires considerable structural modifications within and/or physical expansion of the transfer station. Consequently, each of these systems results in lower hourly throughput capacity at the station and less efficient transportation because of the lower weights per barge and/or container.

[0011] NYCDOS therefore currently is having waste trucked out of New York City to truck based transfer stations at considerable financial and environmental burden to New York City and its residents.

[0012] On a broader national level, the crisis faced by truck transport of materials is becoming increasingly acute with respect to waste materials which are generated in crowded metropolitan areas. As landfill areas which are reasonably accessible to trucking from these metropolitan areas are reaching their capacity, and are soon going to have to close or place limitations on their daily capacity, suitable truck accessible new landfills are not likely to become available. There is, accordingly, an urgent need to find a new way to transport waste to distant landfill areas, and rail is the most suitable transport option.

[0013] Therefore, the challenge to efficient rail transportation of waste is to design a system which can operate: (1) with minimum space requirements; (2) minimizing

multi-handling of the waste; (3) maximizing cycle time for a truck to dump its waste; (4) maximize the dumping stations within a marine transport station or at a rail head; (5) maximize the amount of waste deposited in one container; (6) maximizing the amount of waste deposited onto each barge, such as in the case of the NYCDOS marine transfer station system; and (7) minimizing the structural modifications required within and avoid expansion of each marine transfer station in the case of the NYCDOS system.

[0014] One object of the present invention is to therefore provide a waste transfer apparatus and method that facilitates containerization of waste so that containers can travel by rail or vessels to distant locations. Another object of the present invention is to minimize space needs at the point of transloading the waste from trucks to rail, minimizing the handling and compaction of waste at the transloading location and maximizing the weight of waste loaded onto a standard flat rail car. Yet another object of the present invention is to avoid adding to the traffic burdens of roadways to meet the need for transporting waste by truck out of metropolitan areas to distant landfills.

SUMMARY OF THE INVENTION

[0015] In accordance with the present invention, these and other objects have now been realized by the invention of apparatus for the transfer of waste material comprising a frame having a size sufficient to accept the removable container, the frame including wall means whereby the container can be removably placed within the frame to permit the container to be loaded with the waste material directly from a truck, and container removal means for removing the filled container from the frame for transport to a transportation system.

[0016] In accordance with one embodiment of the apparatus of the present invention, the wall means is in direct contact

with the container so as to provide structural support for the container during loading with the waste material. Preferably, the wall means comprises movable wall means whereby after the container has been removably placed within the frame the wall means can be moved into direct contact with the container.

[0017] In accordance with another embodiment of the apparatus of the present invention, the wall means comprises spacer means for filling the space between the frame and the removable container. Preferably, the spacer means are disposed below the bottom of the removable container. In another preferred embodiment, the spacer means are disposed between the sides of the removable container and the frame.

[0018] In accordance with another embodiment of the apparatus of the present invention, the wall means comprises angled wall means whereby the container can be snugly fit into the frame.

[0019] In accordance with another embodiment of the apparatus of the present invention, the frame includes an upper end and a lower end, and is disposed below the ground level, and the removable container includes a corresponding upper end and lower end.

[0020] In accordance with another embodiment of the apparatus of the present invention, the apparatus includes tire stop means adjacent to the frame for preventing the truck unloading the waste material into the removable container from traveling past the tire stop means.

[0021] In accordance with one embodiment of the apparatus of the present invention, the container has a width of greater than about 9'.

[0022] In accordance with another embodiment of the apparatus of the present invention, the container has a height of greater than about 12 1/2'.

[0023] In accordance with another embodiment of the apparatus of the present invention, the container has a width of about 10 1/2' and a height of about 13'.

[0024] In accordance with another embodiment of the apparatus of the present invention, the container is dimensioned to match the height and width clearances of a common railroad right of way. Preferably, the container comprises a volume of about 2,300 cubic yards. However, in some areas of the U.S. clearances can allow container heights to even exceed 13 feet in height, with corresponding increases in the volumes and maximum loads obtainable therewith.

[0025] In accordance with one embodiment of the apparatus of the present invention, the apparatus includes a scale disposed at the lower end of the frame.

[0026] In accordance with yet another embodiment of the apparatus of the present invention, the apparatus includes an air plenum disposed at the upper end of the frame and a fan associated with the air plenum for creating a negative pressure within the container, whereby dust and odor are eliminated therein. Preferably, the air plenum comprises a perforated pipe. In one embodiment, the perforated pipe runs around the container. In another embodiment, the apparatus includes a filter, whereby the exhaust from the fan is drawn through the filter.

[0027] In accordance with yet another embodiment of the apparatus of the present invention, the apparatus includes a leachate system disposed at the lower end of the frame.

[0028] In accordance with yet another embodiment of the apparatus of the present invention, the apparatus includes spill skirt means disposed at the lower end of the frame to assist in loading the container from the truck. Preferably the spill skirt means includes a flexible bottom portion whereby the spill skirt means can fit over the upper end of

the container. More preferably, the spill skirt means extends from the top of the tire stop means.

[0029] In accordance with another embodiment of the apparatus of the present invention, the apparatus includes a spreader for lifting the container out of the frame. Preferably, the spreader is adapted to expand to accommodate the container.

[0030] In accordance with another embodiment of the apparatus of the present invention, the upper end of the container includes lock means for attachment to the spreader.

[0031] In accordance with another embodiment of the apparatus of the present invention, the movable wall means are associated with at least two adjacent walls of the container.

[0032] In accordance with another embodiment of the apparatus of the present invention, the movable wall means comprises inflatable air bladder means.

[0033] In accordance with a preferred embodiment of the apparatus of the present invention, the spill skirt means is disposed along at least three sides of the frame, the spill skirt means including hinge means whereby the spill skirt means can be positioned on top of the upper end of the container when it is disposed in the frame.

[0034] In accordance with another embodiment of the apparatus of the present invention, the frame is disposed above ground level, and the apparatus include ramp means for permitting a truck to drive to the top of the frame for unloading the waste material.

[0035] In accordance with another embodiment of the apparatus of the present invention, the apparatus includes leveling means for applying pressure to the waste material within the container.

[0036] In accordance with another embodiment of the apparatus of the present invention, the apparatus includes material handling means for removing excess waste material

from the container and transferring it into an adjacent container to adjust the total weight thereof.

[0037] In accordance with another embodiment of the present invention, a method has been provided for the transfer of waste material comprising providing a container including an upper end and a lower end, removably placing the container in a frame to permit the container to be loaded with the waste material directly from a truck, loading the container with the waste material, and removing the filled container from the frame for transfer to a transportation system.

[0038] In accordance with one embodiment of the method of the present invention, the method includes deploying spill skirts to cover the upper end of the container during loading thereof.

[0039] In accordance with another embodiment of the method of the present invention, the method includes moving the wall into direct contact with a container after removably placing the container in the frame.

[0040] In accordance with another embodiment of the method of the present invention, the method includes fitting a cover over the container after the loading of the container with the waste material.

[0041] In accordance with another embodiment of the method of the present invention, the method includes removing the filled container from the frame including lifting the container by means of a spreader.

[0042] In accordance with another aspect of the present invention, apparatus has been discovered for the transfer of waste material comprising a container for acceptance by a frame for removable replacement of the container, the container comprising a first longitudinally extending side wall, a second longitudinally extending side wall, a first rigid end wall attached to the first and second longitudinally extending side walls, a second hinged end wall hingedly

attached to the first and second longitudinally extending side walls, a base, an upper end, a lower end, and hinge means attaching the upper end of the second end wall to the upper end of the first and second longitudinally extending the walls wherein the lower end of the second end wall can hingedly swing open to permit the waste material to exit therefrom, and a central beam extending longitudinally along the base of the container in an intermediate position between the first and second longitudinally extending side walls to structurally reinforce the container.

[0043] In accordance with one embodiment of the apparatus of the present invention, the central beam includes a lower portion extending parallel to the base, and an upwardly extending portion substantially perpendicular to the lower portion, whereby the base is supportingly positioned above the lower portion of the central beam. Preferably, the beam also includes an upper portion extending parallel to the base. In a preferred embodiment, the apparatus includes a protective covering for the portion of the central beam extending above the base. Most preferably, the base is divided into a first base portion and a second base portion on either side of the central beam.

[0044] In accordance with another embodiment of the apparatus of the present invention, the apparatus includes a pair of longitudinally extending side beams extending along the lower ends of the first and second pairs of longitudinally extending side walls. Preferably, the pair of longitudinally extending side beams include a lower portion extending parallel to the base and a side portion extending along the first and second pair of longitudinally extending side walls above the base.

[0045] In accordance with another embodiment of the apparatus of the present invention, the apparatus includes a rear beam extending along the lower end of the base along the

first rigid end wall and a front beam extending along the lower end of the base along the second hinged end wall.

[0046] In accordance with another embodiment of the apparatus of the present invention, the apparatus includes a tapered floor portion disposed adjacent to the second end wall for diverting the waste material from the base towards the second end wall.

[0047] The basic elements of one preferred embodiment of the method of the present invention, is: (i) dump waste from a truck directly into a container which meets the 13' high and 10 1/2' wide standard railroad clearance requirements (referred to herein as a "standard container") at a rail head; and (ii) lift the standard container directly onto a flat rail car.

[0048] The basic elements of one preferred embodiment of the present invention utilizes a bulk transfer operation whereby waste is deposited into apparatus that includes: a ground frame; a Plate F container which is an open top container measuring 13' high and 10 1/2' wide, and thus meets the standard railroad clearance requirements (and can be of varying lengths, although the most common lengths are expected to be either 20' or 40' long, so that either two or four of the standard containers will fit onto a rail car); and a container lifting device equipped with a suitable spreader bar matched to fit the standard container with attachment devices to allow the lifter to lift the standard container.

[0049] The method of operation of the present invention allows it to achieve the foregoing objects in the following manner: (1) multiple frames are located at a rail head, the frames either recessed into the ground, sitting on top of the ground with a ramp leading up to the lip of the frame, or the frame can be partially recessed and partially protrude above the ground; (2) a standard container is provided to sit in the frame; (3) the walls of the frame are moved vertically

(through mechanical, hydraulic or pneumatic methods) to create a tight fit against the container, or the walls of the frame are designed to make a tight contact fitting against the walls of the container with a funnelled opening at the top of the frame to facilitate the movement of the container into the frame, or the space between the walls of the frame and the container are substantially filled by the use of spacers; (4) at the bottom of the frame is a leachate retrieval system and a scale to remove liquids which may collect at the bottom of the frame, and to weigh the contents of the container as it is filled; (5) a truck backs up against one side of the frame and Plate F container until the truck hits a tire stop to prevent it from falling into the container; (6) spill skirts angle upwards and away from the frame at the sides of the frame; (7) a truck dumps its waste into the container; (8) the container is filled (a small material handler may scoop excess waste from a container to prevent excessive overloading and place it into an adjacent container); (9) when the container is considered to be filled, the lid is then closed to seal the container. The material handler may also be used to level and tamp down extra light weight in a container, which is not expected given the volumes of containers per rail car, it is then covered with a tight fitting vinyl, aluminum, steel, or canvas cover, or it includes a cover which is hingedly connected to one of the walls of the container; and (9) the lifter lifts the container and places it on an nearby flat rail car and picks an empty container off a flat rail car and places it back into the vacated frame.

[0050] In further explanation of item (3) above, as the container is being lowered into the frame, a centering mechanism attached to the frame can center the container into the frame. The inside walls of the frame will provide clearance spacing for the outside of the container side walls. This clearance spacing will facilitate movement of the

container in and out of the frame, particularly if the walls of the container become misshapen. Once the container is within the frame, either a mechanism will extend from the inside walls of the frame to make contact with the outer walls of the container or spacers are placed therebetween in order to transmit the structural mass and strength of the frame to provide structural support and strength to the walls of the container so as to prevent the walls of the container from deflecting if material strikes it with sufficient horizontal force while being discharged into the container from the truck or if material has to be tamped down within the container to achieve greater density.

[0051] Alternatively, the walls of the container and frame may be tapered to ease the fitting of the container into the frame, particularly in the event the walls of the container become misshapen.

[0052] In a second alternative, the walls of the frame are designed to fit tight against the container to achieve the foregoing results, but the top of the frame is funnelled to ease the clearances and create a "shoe horn" effect as the container is first placed into the frame.

[0053] If the top walls of the container fall too far out of alignment, it will not match up to the spreader attachment or at worse may have difficulty fitting into the frame, or it may become out of the required clearances. Alternative, but less desirable methods of bringing the container into alignment would be: the use of clamps which attach from the top of the frame to the top walls of the container at key locations to hold the top of the container walls into a fixed position relative to the rigid frame, or the use of toggles attached to the top of the frame capable of pulling the walls of the container at key locations back into proper alignment before the spreader is lowered to attach to the container.

[0054] Each 20' long standard container will have a capacity to handle multiple truck loads, such as from one to three truck loads, for example, depending of the capacity of the weight of the truck loads.

[0055] The sizing of the container is important because it creates a match of container dimensions to standard rail clearances, thus allowing the proposed invention to maximize waste loading onto a single rail car. To the extent that a rail car carries less than its maximum allowed weight, the rail operations becomes less efficient and more expensive for the customer. For a material such as waste which may have a wide range of densities, the use of these specially designed extra-high and wide containers more regularly allows for maximum weight of material to be loaded onto the rail car, resulting in a more efficient and less costly operation (without the need for space consuming crushing and compacting operations on a tipping floor, described above, which is not a suitable operation at a rail head).

[0056] By matching: (1) the heavy frame, made of materials with considerable mass, such as reinforced concrete; (2) with the lighter weight standard container, the proposed invention achieves the goal of allowing the standard container to be held in place as a local truck tips its waste into the container, and allows for the standard container to be lighter so as to allow more waste in each standard container without exceeding the weight limits of the rail car or rail tracks. Thus, lightweight material, such as aluminum or thinner gauges of steel, and the like, can be used for the container, decreasing the cost and weight thereof.

[0057] Alternatively, a stronger standard container could be designed without the frame, but such a container may hold less waste because more weight would go into the container equipment itself, and be more prone to losing shape and alignment over time. In an optimal embodiment, however, a

stronger container has been designed for use with the frame of the present invention. This strengthened container includes a longitudinally extending center beam partially disposed below the base and not interfering with the overall use of the container or significantly reducing the usable space within the container. Indeed, most of the base of the container is the same base floor area before inclusion of the center beam. The use of side beams as well as front and rear beams along the edges of the container provides further potential support therefor.

[0058] The spill skirts are designed so that the top of the spill skirt is several feet above the top of the container, and the bottom of the skirt is flexible or, alternatively, the bottom portion of the skirt is on a hinge so that the bottom of the skirt can fit over the top lip of the container and deflect any waste which overshoots the container back into the container. The spill skirt on the side of the frame at which the local truck discharges its waste runs from the top of the tire stops and extends over the rear lip of the container. This spill skirt directs waste falling from the rear compaction blade as the local truck moves forward and shakes any remaining portions of waste from the rear compaction blade into the container. The other spill skirts extend several feet above the bottom of the local truck bed, and prevent waste from overshooting the container as it directs such waste back into the container. The hinged lid, resting against a stop which is located beyond the far side of the frame, is angled so as to act as a backstop in order to prevent waste from falling beyond the far side of the container as it is being discharged.

[0059] A key objective of the proposed transloading process is to minimize the space needed for a local truck to transfer waste into a standard container. The small space requirements allow multiple frames with standard containers to be located

at a given rail head, which would allow more local trucks to transfer their waste loads per hour.

[0060] Additionally, by dumping into the standard container which is recessed below the level of the truck, discharged waste will fall free of the body of the truck, avoiding the need for the truck to pull forward as it discharges its waste. Furthermore, because the waste is not discharged onto a tipping floor, the waste will not come into contact with the tires of the truck as it naturally would on a tipping floor.

[0061] The Spreader is specifically designed to match the dimensions of the standard container, which is 10 1/2' wide as compared to the standard intermodal spreader, which are only 8 1/2' wide.

[0062] The proposed transloading method and apparatus is suitable for the small and particularly narrow operations required to fit into many rail heads, while minimizing material handling and achieving maximum permissible weight in each standard container and onto each rail car.

[0063] In deploying the proposed invention with a NYCDOS marine transfer station, the frames would be recessed in the floor of the marine transfer station and the standard container placed in the frame. A lifter would then lift a filled container onto a flat barge, whereby at least 24 20' containers would fit on a barge meeting the current dimensions of barges fitting into the marine transfer station system, and the barge would be towed to a location where the containers could be transferred to a rail flat car or an ocean going vessel. Alternatively, the lifter would lift a filled standard container onto a rail flat car located on a rail float barge in the marine transfer station, and the float barge would be towed to a rail float bridge/rail head.

BRIEF DESCRIPTION OF THE DRAWINGS

[0064] The present invention will be more fully appreciated with reference to the following detailed description which in turn refers to the drawings in which:

[0065] Figure 1 is a side elevational view of a waste transfer system in accordance with the present invention;

[0066] Figure 1A is a side, elevational view of another waste transfer system in accordance with the present invention;

[0067] Figure 2 is a rear elevational view of the waste transfer system shown in Figure 1;

[0068] Figure 3 is a top elevational view of the waste transfer system shown in Figure 1;

[0069] Figure 4 is a side elevational view of a container being lifted out of a frame in accordance with the method of the present invention;

[0070] Figure 5 is a side elevational, partial, enlarged, sectional view of a frame and container in accordance with the present invention with the wall retracted;

[0071] Figure 6 is a side elevational, partial, enlarged, sectional view of a frame and a container in accordance with the present invention with the support wall extended;

[0072] Figure 7 is a top, elevational, partially schematic view of a marine transfer station in accordance with the present invention;

[0073] Figure 8 is a top elevational, schematic view of a container for rail road cars in accordance with the present invention;

[0074] Figure 9 is a side, elevational, schematic view comparing a Plate F container to a standard container;

[0075] Figure 10 is a front, elevational, sectional view of a container of the present invention contained within a frame with side and bottom spacers therein;

[0076] Figure 11 is a front, elevational, sectional, partially schematic view of a standard current container of the prior art;

[0077] Figure 12 is a front end, sectional, partially schematic view of an improved container for use in the present invention;

[0078] Figure 13 is a side, elevational, sectional, partially schematic view of the improved container shown in Figure 12; and

[0079] Figure 14 is a side, elevational view of another embodiment of the container of the present invention.

DETAILED DESCRIPTION

[0080] The essence of the present invention is to allow local trucks to transfer their waste directly into a container to be placed on a rail car without first depositing that material on a tipping floor or into a compactor and being able to operate in a minimum amount of space at a rail head or within a marine transfer station. The essence of the proposed invention is a series of operating cycles whereby: local trucks 10 back up to the frame 1 (see Figures 1, 1A, 2 and 3); the truck 10 tips its waste 11 into the standard container 2 in the frame 1; the container 2 is lifted out of the frame 1 (Figure 4); and the container is placed on a rail car or the like. Figures 1 and 1A show a side view of a Truck 10 backed up to the frame 1. Figure 2 shows a rear view with a Truck 10 backed up to the frame 1. Figure 3 shows a top view with a partial view of spill skirts 4 and 5 overhanging the container 2 in the frame 1. Figures 5 & 6 show a close up of the floor and corner of the container 2 and frame 1 with the support wall 15 which extends from the frame 1 to the container 2 in retracted and extended positions, respectively. Figure 8 shows plate F clearances with the maximum volume found at 16 1/2' above the rail at a width of 10 1/2'. When the height of the bed of the rail car at 3 1/2' is taken into account, it leaves

a height of 13' available for the standard container, and Figure 9 compares a standard container (2,730 cubic feet exterior dimension of 20' long container) on a rail car with the largest standard over-the-road container (2,040 cubic feet exterior dimension of 20' long container) commonly utilized in the waste industry. Figures 1 and 1A depict a local truck backed against the tire stops 8 on the front of the frame 1 in which is the standard container 2. The purpose of tire stops 8 is to prevent the truck 10 from damaging the frame 1 or falling into the container 2. The truck 10 discharges its waste 11 (Figure 1) into the standard container 2 located in the frame 1. The spill skirt, 4 and 5, deflects waste 11 which overshoots the container as it is being discharged from the local truck 10 back into the container 2 in Figure 1. In Figure 1A, however, the container has a hinged cover 4A, which is hinged to the top of the container at hinge 6, and can then act as a separate spill skirt 4 shown in Figure 1. The spill skirt 10 shown in Figure 1A includes a rigid spill skirt section 10A, which is attached to the top of the container at a spill hinge 11, which is, in turn, attached to a lower hinged spill section 12, which contacts the top of the container 2. The lower hinged spill section 12 can thus be moved out of the way after the container 2 is filled, by clockwise rotation about spill hinge 11. In this manner, the spill skirt 10 and the hinged cover 4A can act just as the two spill skirts 4 and 5 do in Figure 1, and prevent any of the waste 11 from not entering the container 2.

[0081] When one or more local trucks 10 discharges into the standard container which reach the maximum volumetric or weight capacity of the standard container as determined by the scale 14 at the bottom of the frame 1, excess waste may be picked out of the container and located into an adjacent container. When the container is fully loaded (with one or multiple truck discharges) a tight fitting vinyl, aluminum,

steel, or canvas tarp is placed on top of the container. In Figure 4 a Lifter 13 with the Spreader 12 moves over the standard container and lowers the Spreader until it makes contacts with the Intermodal Twist Locks 7 located at the top of the container's side walls. Figure 4 depicts a crane (bridge or gantry crane) straddling the container as a Lifter 13, but side loader, bridge, gantry, stick cranes and other lifting devices may be employed.

[0082] The Spreader 12 is specifically designed to match the dimension of the standard container, which is 10 1/2' wide as compared to the standard intermodal spreader which are only 8 1/2' wide.

[0083] The Lifter 13 lifts the standard container out of the frame 1 (Figure 4), with the spill skirts, 4 and 5, moving upward to allow clearance, the lifter 13 moves the container over the rail car and deposits it on the rail car. After a filled container is placed on a rail car, the lifter 13 removes an empty container from a rail car and lowers it into a frame 1. Once the container is placed within a frame 1, the inside walls of the frame 1 move inward to make contact with the outside walls of the container (Figures 5 and 6). Alternatively, the inside walls of the frame 1 are tight fitted with a funnel on top or tapered to create a tight fit between the frame and the container. The bottom portions of the spill skirts, 4 and 5, are then placed over the top lips of the container. The cycle is then repeated.

[0084] Figures 1, 2, 3 and 4 depict a standard container sitting in a frame 1. The combination of the standard container and the frame 1 is an essential element of the proposed invention. The frame 1 provides the structural strength and support while trucks 10 discharge their material into the container 2 (Figure 1) and while the material handler may tamp form the waste within a container. By placing added structural strength and support in the frame, which remains

stationary, while the container is being loaded, it allows the container to be lighter and capable of allowing more waste to be placed on a rail car, which would not be the case if the Plate F container had to maintain its full structural strength and support without the aid of the frame. Furthermore, the frame inhibits misshapen or misalignment of the container.

[0085] There are several ways in which the structural support and strength of the frame are translated to the container. The scale with dunnage off of the floor of the frame provides the support directly to the bottom of the container 2. The sides of the frame 1 provide support and strength to the outside walls of the container. The translation of support from the walls of the frame 1 to the container 2 can be enhanced through various devices that remain in the retracted position as the container is lowered into the frame 1 so as to provide clearance between the container and the frame 1 as the container is being placed into the frame 1, but which become deployed by extending inward from the inside walls of the frame 1 to make contact between the frame 1 and the container 2 once the container is fully within the frame. These devices 16, among others, can include, moveable walls, retractable shivs or air bladders 2, or spacers 20 and/or 22 (Figure 10).

[0086] Other enhancements and/or variations which may be deployed as part of the present invention to increase and/or as an alternative means for translation of structural strength and support from the frame 1 to the container 2, would include: the aforementioned centering mechanisms which could also provide a means to translate the structural support and strength of the frame 1 to the container 2. Straight inside walls of the frame 1 which are rigid and fit tightly against the container, but with a funnel shape at the top of the frame to act as a shoe horn to ease the deployment of the container 2 into the frame 1. Clamps which attach from the top of the

frame 1 to the top walls of the container 2 (Figures 1 and 2) at key locations hold the top of the container walls into a fixed position relative to the rigid frame 1. Finally, the clamps will also be capable of acting as toggles capable of pulling the walls of the container at key locations back into proper alignment before the Spreader is lowered to attach to the container (Figure 4).

[0087] However, one particularly preferred embodiment of the present invention is shown in Figure 10 hereof. Thus, while the sides of the frame 1 may and should be larger than the size of the container 2 to be fitted therein, the difference in spacing can be made up with or without the use of movable walls as discussed above. In particular, a bottom spacer 20 can be placed in the frame 1 below the container 2, and/or side spacers 22 can be placed on one or more sides of the container 2 between the container 2 and the wall of the frame 1. This provides for transfer of structural strength to the side walls of the container 2 without necessarily requiring movable walls within the frame itself. It is also noted that in the embodiment of container 2 shown in Figure 10 that a container contains a hinged cover 24 hinged to the side wall of the container 2 at 26, so that upon filling of the container 2 the cover 29 may merely be hinged around hinge 26 to close the container itself.

[0088] After an empty container is placed back in a frame 1, the bottom of the flexible spill skirts, 4 and 5, are draped over the top lip of the container 2. Alternatively, the rigid hinged bottom of a spill skirts, 4 and 5, are moved in an upward position while the container 2 is being placed in the frame 1, and then deployed into a downward position after the container 2 is located in the frame 1.

[0089] A scale 14 located at the bottom of the frame 1 measures the amount of accumulative waste being loaded into the container. Alternatively, a truck scale in front of the

frame can measure waste as it is being discharged from the truck 10, and a program can keep track of the aggregate waste being discharged into the container.

[0090] A leachate collection system 17 (Figure 1) consisting of piping at the bottom of the frame connected to plumbing running up and within the wall of the frame 1 and a pump at the top of the frame 1 will retrieve leachate which may accumulate at the bottom of the frame 1.

[0091] The Spreader 13 may come in a variety of shapes not depicted in the attached figures provided that the pick points on the Spreader 13 match up with the intermodal twist locks on the standard container, which are located 20' long and 10 1/2' wide. Thus, in order to be accommodated to the size of the standard container, the Spreader must be able to be expanded as compared to the size of smaller containers such as those previously utilized.

[0092] Figure 7 depicts the potential placement of 10 frames 1 on the platform of a NYCDOS marine transfer station with a barge 18 located adjacent to the platform.

[0093] Figure 8 shows a diagrammatic representation of a Plate F railroad container. This container includes a maximum container height of about 13', which when added to the approximately 3 1/2' from the rail bed includes a maximum height of 16 1/2' with a width of 10 1/2'. This is compared to a standard over-the-road-compatible container in Figure 9.

[0094] As is discussed in more detail above, the present invention also contemplates structurally reinforcing the container used in connection with the present invention. Figure 11 shows a standard current container of the prior art. Once again, these standard waste containers designed for both rail and highway travel are about 20' long, about 12' high, and about 8 1/2' wide. Conventionally, they are designed to be top loaded, but when they reach their destination, the container is tipped towards one end and the waste material

slides towards an outlet end, which includes an open door. Structural rigidity is generally applied to the bottom of the frame itself with support beams made of tubes, angle beams or other such beams running along the sides and ends of the container bottom. The container floor itself is generally set flush to the tops of these beams as shown in Figure 11 in a manner so that the floor is also flush with the container end when it is opened so that it will not impede discharge of the waste material when that occurs. This will reduce the overall area within the container itself.

[0095] Turning to Figure 12, it must first be realized that even with structural support these containers have a floor which must span 8 1/2', covering a total floor space of approximately 170 square feet. This creates a flexing effect when the container is fully loaded and during transit of the container. This can adversely impact on the volume of weight which can be loaded into the container, and the flexing itself has a materially adverse effect on the structural integrity and need for significant maintenance for these containers.

[0096] In the prior art containers shown in Figure 11, use of these structural supports at the bottom raise the floor by about 1', thus further limiting the available interior container height and overall volume of waste material loadable into the container.

[0097] Turning again to the improved container shown in Figure 12, this design provides a container which can be as wide as 10 1/2' while still maintaining structural integrity. This is done, however, without exacerbating the flexing of the base which is discussed above which occurs with the standard container currently in use. Firstly, the container 2 shown in Figure 12 includes a central beam 30 running longitudinally along the entire length of the container and a central portion of the base 32 thereof. The central beam 30 used in Figure 12 can be referred to as an I-beam or an H-beam in that it

includes a lower portion 34 running parallel but below the base 32, a central portion 36 extending above the base of the container 2 and an upper portion 38 extending parallel to the base 32. The base 32 is thus divided into two portions 32a and 32b on either side of the central beam 30, each of which rests upon the top of the lower portion 34 of the central beam 30 and is supported thereby.

[0098] Additional side angle beams 40 and 42, including a lower portion 42 extending along the base of floor portion 32a longitudinally along the container 2 and an upwardly extending portion 42a extending above the floor 32a, also along the edge and providing lateral support along the entire lower portion of the container 2, and similar beam 40 on the other side of the container 2 including lower portion 40b and upper portion 40a thereof.

[0099] This design thus initially provides increased structural rigidity and support to the container floor itself. Furthermore, by using beams with flanges such as I-beams, H-beams or angle beams on the sides, the floor portions can be set at the lower portions of these structures which thereby support same. As compared to the prior art containers such as those of Figure 11, over one foot of interior height can be added to the container while at the same time increasing the interior container volume, less the minor amount of volume taken up by the beam itself. With the beam 30 running along the central portion of the container 2, the floor portions are essentially divided in half, so that the maximum span across the floor from the central beam to the side wall is less than half of the total floor space in the container. This in itself significantly decreases the flexing factor for the floor. Finally, the central beam 30 does not in any way impede the discharge of waste material from the container, which flows lengthwise along the container and along the central beam out the open end of the container end wall.

[0100] This can be seen more particularly in Figure 13 which is a side view of the container shown in Figure 12. Thus, the hinged end wall 50, which can be hinged to the side walls at the upper end 51 thereof, can swing open at its lower end 52 upon tipping so that the waste material can exit from right to left in Figure 13 out of the front end 50 of the container. A tapered portion 54 or ramp can be included at the lower end of the hinged wall 50 to assist the waste material in exiting the container 2 if necessary. Also, the central beam extending above the floor 32 shown in Figure 12 can include a protective covering 56 to merely cover the beam without interfering with any of the objectives of the present invention.

[0101] As can be seen in Figure 13, front and rear transverse beams 58 and 60, similar to the angle beams 40 and 42 shown in Figure 12, can also be included running transversely at the lower end of the front and rear ends of the container 2 for similar structural support purposes. Once again in this case, the floor itself can rest on the lower portion of these angle beams 58 and 60 for further support of the floor itself. It is also apparent that the same construction shown in Figure 13 can be applied to narrower 8 1/2' containers, for example, to obtain the same benefits of structural integrity, and increased interior height and volumes.

[0102] Turning to Figure 14, another embodiment of container 2 is shown therein. In this embodiment, the side walls 65 and 66 include an air plenum 68, which runs around the entire circumference of the container walls, and which can be, for example, a perforated pipe or the like. Attached to the air plenum 68 is a duct 69, which, in turn, leads to a fan 70 which can induce a draft within the air plenum 68, and create a negative pressure within the container 2. A filter 71 is affixed to the exhaust from the fan 70, and in this

manner dust and odors within the container 2 are withdrawn through duct 69, and expelled from the container 2 and/or collected in filter 71.

[0103] Although the invention herein has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and applications of the present invention. It is therefore to be understood that numerous modifications may be made to the illustrative embodiments and that other arrangements may be devised without departing from the spirit and scope of the present invention as defined by the appended claims.